

State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

STANDING STOCKS OF FISHES IN
SECTIONS OF RED CLOVER CREEK,
PLUMAS COUNTY, 1990

by

Charles J. Brown

Bay-Delta and Special Water Projects Division

STANDING STOCKS OF FISHES IN SECTIONS
OF RED CLOVER CREEK, PLUMAS COUNTY, 1990

INTRODUCTION

Red Clover Creek (Figure 1) is the site of a proposed and authorized dam (Abbey Bridge) that would be a part of the State Water Project. It is also the site of projects designed to reduce quantities of granitic sand flowing into Indian Creek and the Feather River. Red Clover Creek is an important source of rainbow trout (Oncorhynchus mykiss) in the Indian Creek system.

An earlier study of standing stocks of fishes in Red Clover Creek established stations for long-term studies of trout populations in this watershed (Brown 1976). Four stations identified and sampled in 1976 were sampled again in 1988 (Brown 1990). Biomass of trout was much higher in 1988 than 1976.

The purpose of this study is to report the results of periodic fish sampling at established stations in Red Clover Creek for the purpose of gathering information on tributaries to Indian Creek which will add to our knowledge of the dynamics of that system. This knowledge will be used in evaluating the effects of proposed projects such as dam construction on the fishery resources of this system.

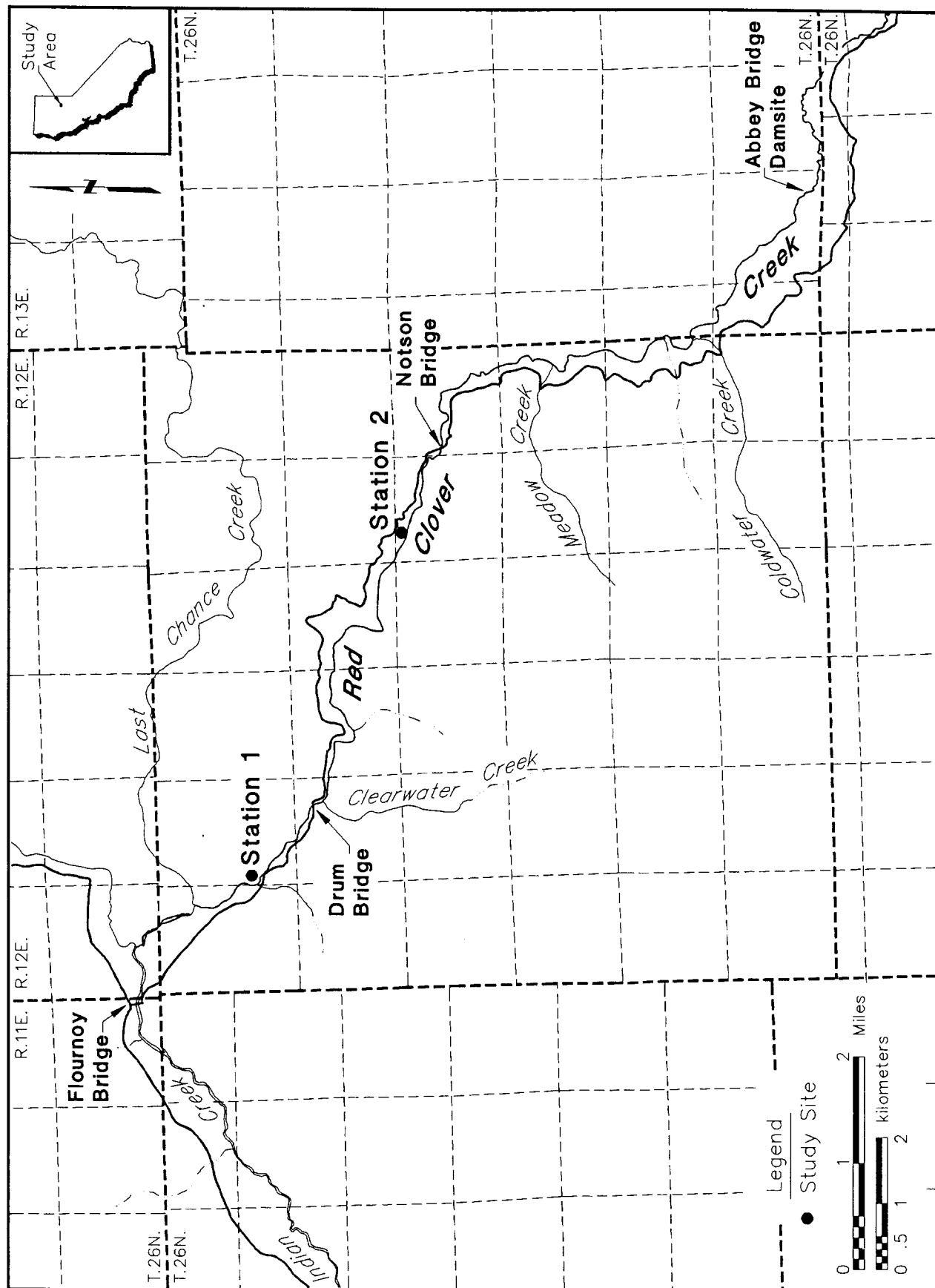


Figure 1. Stations Sampled to Estimate Standing Crop of Trout in Red Clover Creek, Plumas County, 1990.

METHODS

Standing stocks of fishes were estimated at two stations in Red Clover Creek (Figure 1) in Plumas County. The length, average width, and average depth of each station were measured (Appendix 1). Fish were captured with a battery powered backpack electroshocker in stream sections blocked by seines . Captured fish were removed from the net-enclosed section on each pass. Standing stock estimates were developed using the two-count method of Seber and LeCren (1967) or the multiple-pass method of Leslie and Davis (1939) with limits of confidence computed using a formula proposed by DeLury (1951).

The weights of rainbow trout and brown trout were determined by displacement. Weights were measured for all trout caught, and fork lengths (FL) of each fish was measured to the nearest millimeter. Sacramento sucker (Catostomous occidentalis) and speckled dace (Rhinichthys osculus) were counted; however, no weights were measured for these species.

Scale samples were taken only from rainbow trout over 100 mm in length. No brown trout over 100 mm in length was caught. Scales were mounted dry between microscope slides, and their images were projected on a NCR microfiche reader at a magnification of 42X. Scale measurements for the calculation of growth were recorded to the nearest millimeter along the anterior radius of the anterior-posterior axis of the scale.

Geometric mean functional regressions were used to describe the body-scale and length-weight relationships (Ricker, 1975). Estimation of true mean growth rate (G) was calculated using methods of Ricker (op. cit.).

Distribution of all fish caught is listed according to location. Standing crops of brown trout and rainbow trout were calculated for individual stations where the species of interest were caught and combined for the entire creek. Age and growth were calculated only for rainbow trout. Mean individual growth was calculated only for rainbow trout. Length-weight relationships were determined for rainbow trout in Red Clover Creek. The coefficient of condition and 95 percent confidence intervals were calculated for rainbow trout.

RESULTS

Distribution

Rainbow trout were caught at stations 1 and 2. Brown trout were caught only at Station 1. Sacramento sucker and speckled dace were caught only at Station 2 (Table 1).

Table 1. Distribution of Fishes in Sections of Red Clover Creek, 1990.

	Station Number	
	1	2
Distance above mouth (km)	2.4	9.7
Rainbow Trout	X	X
Brown Trout	X	
Sacramento sucker		X
Speckled dace		X

Standing Crop

Rainbow trout were the most common game fish caught in Red Clover Creek. Biomass averaged 4.6 g/m^2 at two stations. Biomass for rainbow trout large enough for fishermen to catch and keep (127 mm FL) averaged 4.0 g/m^2 (Table 2). Brown trout biomass was 0.1 g/m^2 ; no catchable brown trout was caught (Table 3).

Table 2. Estimates of Rainbow Trout Standing Crop in Red Clover Creek, Plumas County, 1990.

Distance above mouth (km)	Population Estimate	95% Confidence Interval	Biomass (g/m^2)	Estimate of Catchable Trout ($\geq 127 \text{ mm FL}$)	Biomass of Catchable Trout (g/m^2)
2.4	71	59-88	6.5	37	5.6
9.7	27	27-29	2.7	18	2.3

Table 3. Estimates of Brown Trout Standing Crop in Red Clover Creek, Plumas County, 1990.

Distance above mouth (km)	Population Estimate	95% Confidence Interval	Biomass (g/m ²)	Estimate of Catchable Trout (>127 mm FL)	Biomass of Catchable Trout (g/m ²)
2.4	3	3-6	0.1	0	0

Sacramento sucker and speckled dace were the only non-salmonid fish caught in Red Clover Creek. Biomass averages were not calculated for these species, because the weights were not recorded (Table 4).

Table 4. Population Estimates of Nongame Fishes in Red Clover Creek, Plumas County, 1990.

Distance above mouth (km)	Species	Population Estimate	95% Confidence Interval
9.7	Sacramento sucker	11*	---
9.7	Speckled dace	224	166-282

* Number is the total catch. Due to an irregular removal pattern, the population estimate was unreliable.

Age and Growth

The formula $L = 25.2 + 4.4 S$ describes the relationship between the fork length (L) and enlarged scale radius (S) of 66 rainbow trout. The coefficient of correlation (r^2) is 0.72.

Population growth rate was faster than mean individual growth in age 1+ fish (Table 5).

Table 5. Growth Rates for Rainbow Trout Caught in Red Clover Creek, Plumas County, 1990

Age Interval	Population Growth			Mean Individual Growth		
	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate Gx	Length Interval (mm)	Difference of Natural Logarithms	Instantaneous Growth Rate Gx
1-2	85-173	0.711	2.1	101-173	0.054	1.6

Age 1+ rainbow trout averaged 142 mm in fork length; age 2+ fish averaged 206 mm (Table 6).

Table 6. Calculated Fork Length of Rainbow Trout from Red Clover Creek, Plumas County, 1990

Age	No. of Fish	Length at Capture (mm)	Calculated Lengths at Successive Annuli	
			1	2
1	61	142	85	-
2	5	206	101	173
Number of back-calculations			66	5
Weighted means (mm)			86	173
Increments (mm)			86	87

Length and Weight

Age group 0+ rainbow trout represented 22% of the catch. Age group 1+ trout comprised 72% of the total, and age 2+ fish made up the remaining 6% of the catch (Figure 2) (Appendix 2).

The relationship between length (L) and weight (W) of rainbow trout is:

$$\text{Log}_{10}W = -4.6 + 2.9 \text{ Log}_{10}L$$

$$r^2 = 0.98$$

$$N = 87 \text{ (Figure 3) (Appendix 4)}$$

Not enough brown trout were caught, so we did not calculate the relationship between length (L) and weight (W) (Appendices 3 and 5).

Coefficient of Condition

We calculated the coefficient of condition and 95% confidence limits for a total of 87 rainbow trout (Table 7). There is no significant difference between the coefficient of condition for any age group of rainbow trout we tested ("t" test, 0.05 level).

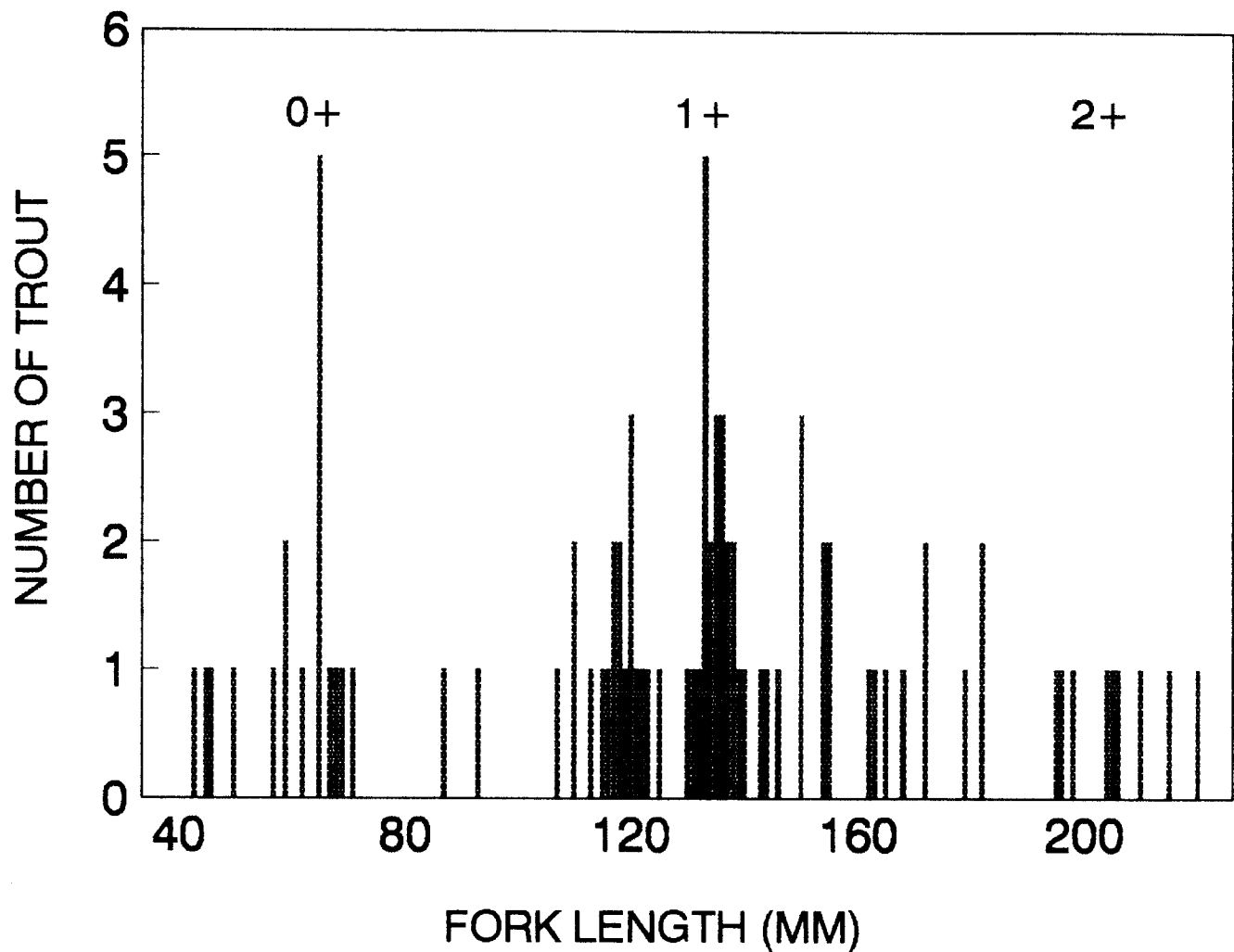


FIGURE 2. Length, observed frequency, and age of rainbow trout caught in Red Clover Creek, Plumas County, 1990.

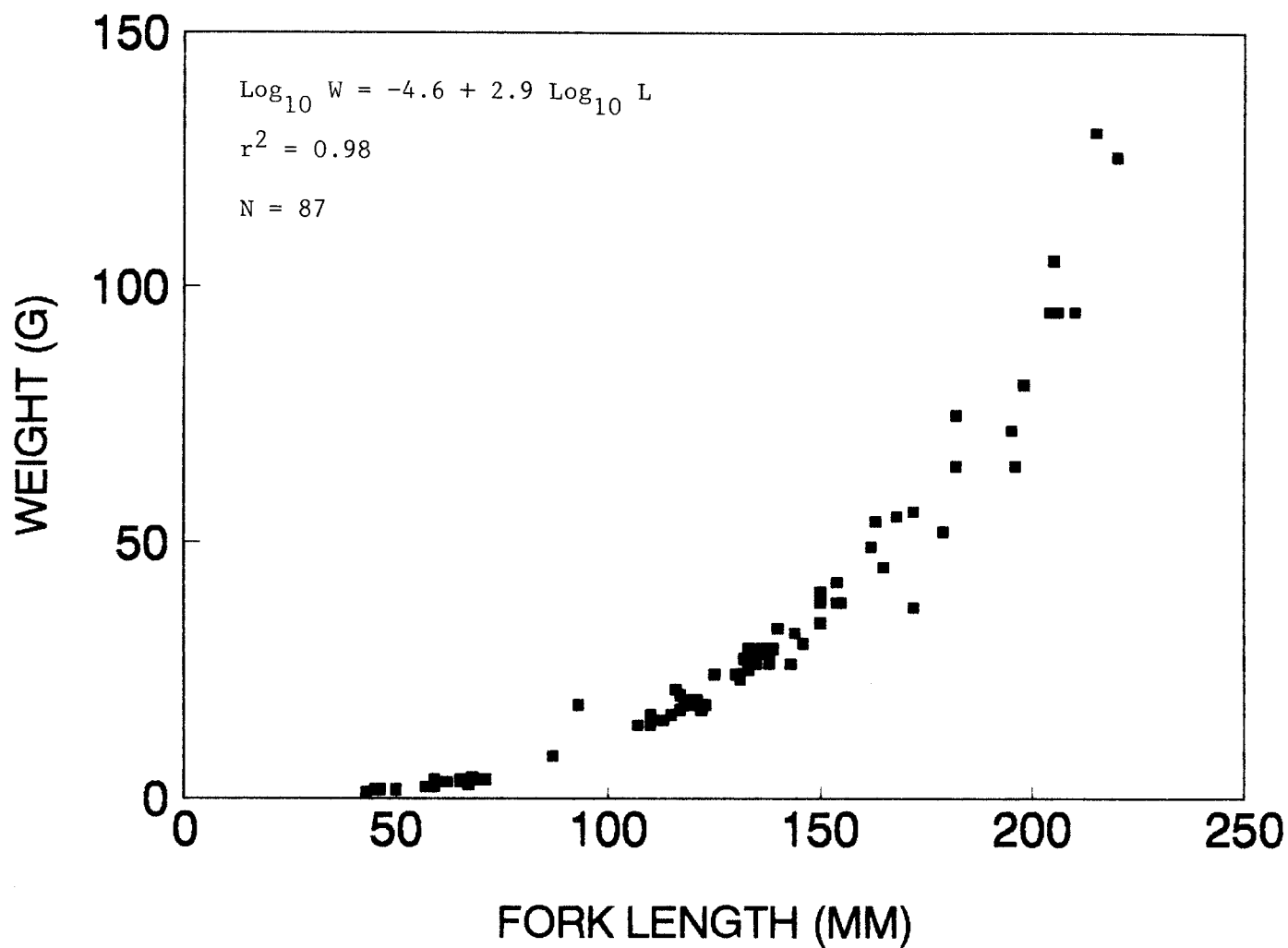


FIGURE 3. The relationship between length and weight of rainbow trout caught in sections of Red Clover Creek, Plumas County, 1990.

Table 7. Coefficient of Condition and Age of Rainbow Trout in Red Clover Creek, Plumas County, 1990.

Age Group	Number of Fish	Coefficient of Condition	95% Confidence Interval
Rainbow Trout			
0+	19	1.2677	0.6502-1.8853
1+	63	1.0833	0.8855-1.2811
2+	5	1.1627	0.9688-1.3565
Combined	87	1.1282	0.7594-1.4969

LITERATURE CITED

- Brown, C. J. 1976. Standing stocks of fishes in sections of Red Clover, Little Last Chance, Big Grizzly, Last Chance, and Squaw Queen Creeks, Plumas County, 1976. Calif. Dept. of Fish and Game, 8 p.
- . 1990. Results of sampling fish in sections of Red Clover Creek, Plumas County, 1988. Calif. Dept. of Fish and Game, 23 p.
- DeLury, D.B. 1951. On the planning of experiments for the estimation of fish populations. J. Fish. Res. Bd. Canada. 8:281-307.
- Leslie, P. H., and D.H.S. Davis. 1939. An attempt to determine the absolute number of rats in a given area. J. Animal Ecology. 8:94-113.
- Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Fish. Res. Bd. Canada. Bull. 191, 382 pp.
- Seber, G.A.F., and E.D. LeCren. 1967. Estimating population parameters from catches large relative to the population. J. Animal Ecology. 36(3): 631-643.

APPENDIX 1

FISH POPULATION STATIONS FOR RED CLOVER CREEK, 1990

Station 1 - Located 2.4 stream km upstream from the confluence with Indian Creek. Drive up Genesee-Beckwourth Road (26N16) 2.7 km above Flournoy Bridge to a small, dry watercourse. Hike downhill about 46 m. to Red Clover Creek, near the site of the abandoned DWR Red Clover near Genesee streamgage (SE 1/4 of SW 1/4, Section 5, T2N, R12E). This station is labeled RC-3 in DFG Region 2 files. The station is comprised primarily of large boulders and is mostly a deep run (95%), with some pool area (5%). It is 32.5 m long, with average width of 7.1 m, and average depth of 0.43 m, giving it a surface area of 231 m² and a volume of 99 m³.

Station 2 - Located 9.7 stream km upstream from the confluence with Indian Creek. Drive up Genesee-Beckwourth Road about 11.3 km to the campsite at the top of the canyon. Hike down to the stream adjacent to the campsite (SW 1/4, NE 1/4, Section 14, T25N, R12E). This station has many large boulders, but also has some gravel and sand bottom areas. It is mostly pool area (66%), with some run (19%) and riffle (15%). Its length is 60 m, with an average width of 4.5 m, and an average depth of 0.3 m, giving it a surface area of 270 m² and a volume of 81 m³.

APPENDIX 2

LENGTH AND NUMBER OF RAINBOW TROUT CAUGHT IN RED CLOVER CREEK, 1990

<u>Fork Length (mm)</u>	<u>Number of Fish</u>	<u>Fork Length (mm)</u>	<u>Number of Fish</u>
43	1	133	5
45	1	134	2
46	1	135	3
50	1	136	3
57	1	137	2
59	2	138	2
62	1	139	1
65	5	140	1
67	1	143	1
68	1	144	1
69	1	146	1
71	1	150	3
87	1	154	2
93	1	155	2
107	1	162	1
110	2	163	1
113	1	165	1
115	1	168	1
116	1	172	2
117	2	179	1
118	2	182	2
119	1	195	1
120	3	196	1
121	1	198	1
122	1	204	1
123	1	205	1
125	1	206	1
130	1	210	1
131	1	215	1
132	1	220	1

APPENDIX 3

LENGTH AND NUMBER OF
BROWN TROUT CAUGHT IN
RED CLOVER CREEK, 1990

<u>Fork Length</u> <u>(mm)</u>	<u>Number</u> <u>of</u> <u>Fish</u>
81	1
87	2

APPENDIX 4

LENGTH AND WEIGHT OF RAINBOW TROUT CAUGHT IN RED CLOVER CREEK, 1990

<u>Fork Length (mm)</u>	<u>Weight (g)</u>	<u>Fork Length (mm)</u>	<u>Weight (g)</u>
43	1	133	29
45	1.5	133	25
46	1.5	134	26
50	1.5	134	28
57	2	135	26
59	2	135	26
59	3.5	135	28
62	3	136	29
65	3	136	28
65	3.5	136	29
65	3	137	28
65	3	137	29
65	3.5	138	26
67	2.5	138	28
68	4	139	29
69	3.5	140	33
71	3.5	143	26
87	8	144	32
93	18	146	30
107	14	150	34
110	14	150	38
110	16	150	40
113	15	154	42
115	16	154	38
116	21	155	38
117	20	155	38
117	17	162	49
118	18	163	54
118	18	165	45
119	18	168	55
120	18	172	37
120	19	172	56
120	18	179	52
121	19	182	65
122	17	182	75
123	18	195	72
125	24	196	65
130	24	198	81
131	23	204	95
132	27	205	105
133	27	206	95
133	25	210	95
133	26	215	130
		220	125

APPENDIX 5

LENGTH AND WEIGHT OF BROWN
TROUT CAUGHT IN RED CLOVER
CREEK, 1990

<u>Fork Length (mm)</u>	<u>Weight (g)</u>
81	6.5
87	7.5
87	8.0